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“Combining IRIS/Hinode observations and modelling: a pathfinder for
coronal heating”

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The combination of imaging and spectroscopic instruments with multiple temperature diagnostics at high spatial, temporal and spectral resolution can allow to recover the 3D plasma flow and thermodynamic evolution associated to specific coronal heating mechanisms. Although very hard considering the complexity of the solar atmosphere, this approach is becoming possible now through combination of instruments such as IRIS and Hinode, and with proper guiding from advanced numerical simulations and forward modelling. In this talk I will focus on a particular example of this approach, a recently published case study, that serves as a pathfinder in the search for the dominant coronal heating mechanism. In this case, resonant absorption, a long hypothesised wave-related energy conversion mechanism is spotted in action for the first time, and is characterised by a peculiar 3D motion of the plasma. With the help of 3D MHD numerical simulations and forward modelling the observational signatures of resonant absorption are characterised, matching very well the observational results. The process through which this mechanism can lead to observed significant heating in the solar corona is further identified: the resonant flow becomes turbulent, following dynamic instabilities, and heats the plasma. I will show how this resonance and instability dual process is expected in different scenarios of the solar atmosphere (the corona, prominences and spicules) and can potentially explain several observed features that remain so far unexplained.